



**European Communication  
Format – B2B**

**Environmental  
Product Declaration**

**Polyvinylchloride (PVC)  
low noise pipe system for  
soil and waste removal in  
the building**

## **1 DECLARATION OF GENERAL INFORMATION**

### **Introduction**

The European Plastics Pipes and Fittings Association (TEPPFA) deems it important to have an insight into the integral environmental impacts that are encountered during the life-span of particular pipe system applications. With this framework in mind, in 2010 TEPPFA has set up an LCA/EPD project with the Flemish Institute for Technological Research (VITO) which resulted in an EPD. The present EPD is the update of the EPD issued in 2013 – foreground data remained the same, with only the datasets being updated to the latest available version (Ecoinvent 3.3 and Industry 2.0 replaced Ecoinvent 2 datasets). It outlines the various environmental aspects which accompany the polyvinylchloride (PVC) low noise pipe system for soil and waste removal in the building, from the primary extraction of raw materials up to and including the end of life (EoL) treatment after its reference service life time.

### **Name and address of manufacturers**

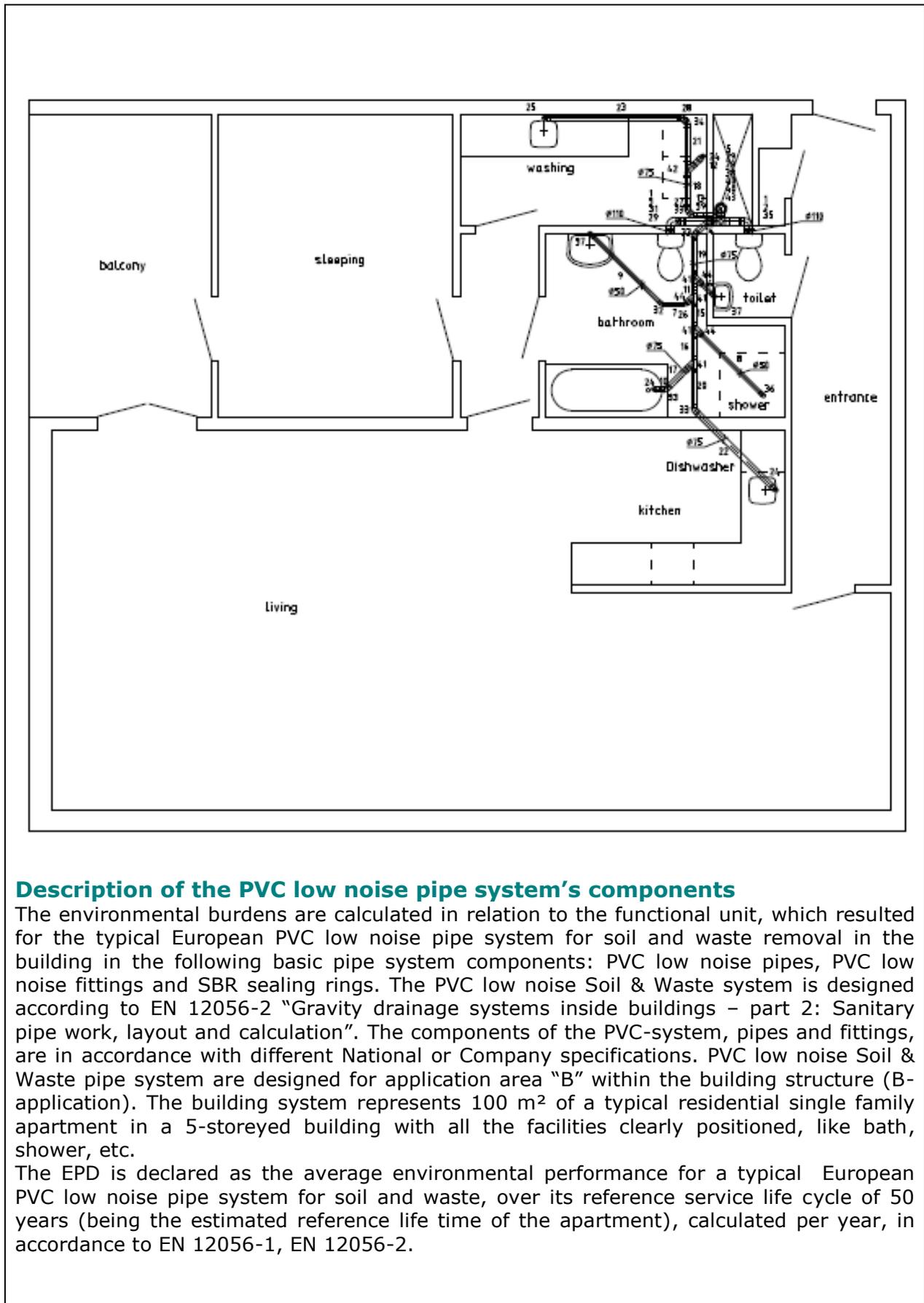
TEPPFA, Avenue de Cortenbergh, 71, B-1000 Brussels, Belgium, Tel: +32-2-736 24 06, Fax: +32-2-736 58 82, E-Mail: [info@teppfa.eu](mailto:info@teppfa.eu), Website: [www.teppfa.eu](http://www.teppfa.eu)

### **PVC low noise pipe system's use and functional unit**

The EPD refers to a typical European PVC LOW NOISE pipe system for soil and waste removal in the building, from the cradle to the grave, including raw material extraction, transportation to converters, converting process, transport to apartment, construction, use and end of life. Environmental indicators are expressed for the complete life cycle, from the cradle to the grave, so for a typical European PVC low noise pipe system. The functional unit is defined as "the gravity discharge and transport of soil and waste, from a well-defined apartment to the entrance of a public sewer system, and this by means of a PVC low noise Soil and Waste gravity drainage system installation into the 100 m<sup>2</sup> apartment, incorporating a bathroom, separate WC, kitchen and washroom (considering the service life time of the pipe system to be aligned with the 50 year life of the apartment), calculated per year".

### **Product name & graphic display of product**

PVC low noise pipe system for soil and waste removal from the building



**Description of the PVC low noise pipe system’s components**

The environmental burdens are calculated in relation to the functional unit, which resulted for the typical European PVC low noise pipe system for soil and waste removal in the building in the following basic pipe system components: PVC low noise pipes, PVC low noise fittings and SBR sealing rings. The PVC low noise Soil & Waste system is designed according to EN 12056-2 "Gravity drainage systems inside buildings – part 2: Sanitary pipe work, layout and calculation". The components of the PVC-system, pipes and fittings, are in accordance with different National or Company specifications. PVC low noise Soil & Waste pipe system are designed for application area "B" within the building structure (B-application). The building system represents 100 m<sup>2</sup> of a typical residential single family apartment in a 5-storeyed building with all the facilities clearly positioned, like bath, shower, etc.

The EPD is declared as the average environmental performance for a typical European PVC low noise pipe system for soil and waste, over its reference service life cycle of 50 years (being the estimated reference life time of the apartment), calculated per year, in accordance to EN 12056-1, EN 12056-2.

### **EPD programme and programme operator**

The present EPD is in line with the ongoing standardization work by CEN TC 350 (EN15804 and EN15942). A programme operator related to the CEN TC 350 has not been established yet.

### **Date of declaration and validity**

August, 2018

The EPD has a 5 year validity period (August, 2023)

### **Comparability**

Please note that EPDs of construction products may not be comparable if they do not comply with the CEN TC 350 (EN15804 and EN15942) standards.

### **Typical European PVC low noise pipe system EPD**

The present EPD outlines various environmental aspects which accompany a representative typical European PVC low noise pipe system for soil and waste removal from the building, from the primary extraction of raw materials up to and including the end of life (EoL) treatment after its reference service life time of 50 years (considering the service life time of the pipe system to be aligned with the 50 year service life time of the apartment).

### **Group of manufacturers**

The EPD for the PVC low noise Soil and Waste pipe system is representative for an anticipated European typical PVC low noise Soil and Waste pipe system. The TEPPFA member companies represent more than 50% of the European market for extruded plastic pipes. For an overview of all members and national associations within TEPPFA we refer to pages 12 and 13 of this EPD.

### **Content of the product system**

The product system does not contain materials or substances that can adversely affect human health and the environment in all stages of the life cycle.

### **Retrieve information**

Explanatory material may be obtained by contacting TEPPFA (<http://www.teppfa.eu>)

## **2 DECLARATION OF THE MATERIAL CONTENT**

The European polyvinylchloride (PVC) low noise Soil and Waste pipe system does not contain any substances as such or in concentration exceeding legal limits, which can adversely affect human health and the environment in any stages of its entire life cycle.

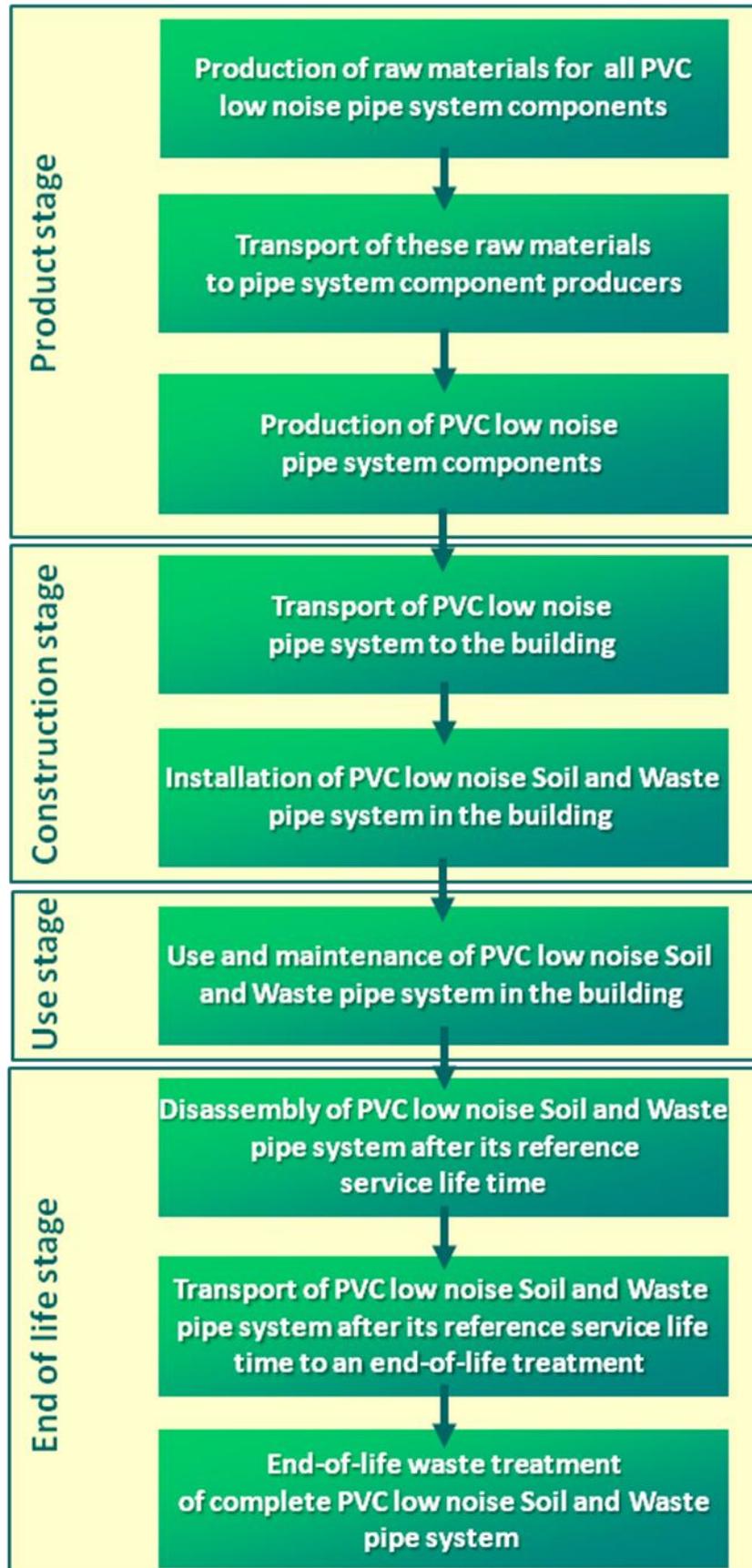
## **3 DECLARATION OF THE ENVIRONMENTAL PARAMETERS DERIVED FROM LCA**

### **3.1 Life cycle flow diagram**

The EPD refers to a typical European PVC Low noise Soil and Waste pipe system, from the cradle to the grave, including product stage, transport to construction site and construction

process stage, use stage and end of life stage.

- **Product stage:** raw material extraction and processing, recycling processes for recycled material input, transport to the manufacturer, manufacturing (including all energy provisions, waste management processes during the product stage up to waste for final disposal):
  - Production of raw materials for PVC low noise pipes
  - Transport of PVC low noise raw materials to converter
  - Converting process for PVC low noise Soil and Waste pipes (extrusion)
  - Production of raw materials for PVC low noise fittings
  - Transport of PVC low noise fittings raw materials to converter
  - Converting process for PVC low noise fittings (injection moulding)
  - Production of SBR sealing rings (raw materials + converting process)
  - Production of solvent cement
  - Production of cleaning agent
- **Construction process stage:** including all energy provisions, waste management processes during the construction stage up to waste for final disposal
  - Transport of PVC low noise Soil and Waste pipe system to the building
  - Installation of PVC low noise Soil and Waste pipe system to the building
- **Use stage** (maintenance and operational use): including transport and all energy provisions, waste management processes up to waste for final disposal during this use stage
  - Use and maintenance of the complete PVC low noise Soil and Waste pipe system during 50 years of reference service life time of the apartment
- **End of life stage:** including all energy provisions during the end of life stage
  - Disassembly of the complete PVC low noise Soil and Waste pipe system after 50 years of reference service life time at the building
  - Transport of the complete PVC low noise Soil and Waste pipe system after 50 years of reference service life time at the building to an end-of-life treatment
  - End-of-life treatment of complete PVC low noise Soil and Waste pipe system after 50 years of reference service life time at the building



### 3.2 Parameters describing environmental impacts

The following environmental parameters are expressed with the impact category parameters of the life cycle impact assessment (LCIA).

Impact category	Abiotic depletion	Abiotic depletion (fossil fuels)	Acidification	Eutrophication	Global warming	Ozone layer depletion	Photochemical oxidation
	kg Sb eq	MJ	kg SO <sub>2</sub> eq	kg PO <sub>4</sub> --- eq	kg CO <sub>2</sub> eq	kg CFC-11 eq	kg C <sub>2</sub> H <sub>4</sub> eq
Product stage	8,62E-06	3,91E+01	5,94E-03	9,96E-04	1,81E+00	5,83E-07	3,80E-04
Construction process stage	1,65E-06	5,17E+00	1,33E-03	2,41E-04	3,73E-01	5,40E-08	8,67E-05
Use stage	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
End of life stage	1,71E-07	3,06E-01	3,70E-05	1,94E-05	2,03E-01	5,19E-09	4,09E-06
<b>Total</b>	<b>1,04E-05</b>	<b>4,46E+01</b>	<b>7,30E-03</b>	<b>1,26E-03</b>	<b>2,39E+00</b>	<b>6,42E-07</b>	<b>4,70E-04</b>

### 3.3 Parameters describing resource input

The following environmental parameters apply data based on the life cycle inventory (LCI).

Environmental parameter	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	Use of renewable primary energy resources used as raw materials	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	Use of non renewable primary energy resources used as raw materials	Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	Use of secondary material	Use of renewable secondary fuels	Use of non renewable secondary fuels	Net use of fresh water
	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	kg	MJ, net calorific value	MJ, net calorific value	m <sup>3</sup>
Product stage	n.a.	n.a.	5,19E+00	n.a.	n.a.	4,60E+01	n.a.	n.a.	n.a.	1,28E-01
Construction process stage	n.a.	n.a.	1,18E-01	n.a.	n.a.	5,20E+00	n.a.	n.a.	n.a.	1,32E-03
Use stage	n.a.	n.a.	0,00E+00	n.a.	n.a.	0,00E+00	n.a.	n.a.	n.a.	0,00E+00
End of life stage	n.a.	n.a.	-1,55E-01	n.a.	n.a.	-3,69E-01	n.a.	n.a.	n.a.	-5,63E-04
<b>Total</b>	<b>n.a.</b>	<b>n.a.</b>	<b>5,16E+00</b>	<b>n.a.</b>	<b>n.a.</b>	<b>5,09E+01</b>	<b>n.a.</b>	<b>n.a.</b>	<b>n.a.</b>	<b>1,28E-01</b>

\*Primary energy and primary energy resources used as raw materials. According to EN15804 these categories should be expressed in MJ, net calorific value, but conversion factors are not available

\*\* Only for foreground process from which LCI data are made available by TEPPFA - the number does not include processes and materials modeled by means of background data, e.g. transportation, electricity, ancillary materials.

### 3.4 Parameters describing different waste categories and further output material flows

The parameters describing waste categories and other material flows are output flows derived from the life cycle inventory (LCI)

#### Parameters describing different waste categories

Environmental parameter	Hazardous waste	Non-hazardous waste	Nuclear waste
	kg	kg	kg
Product stage	2,52E-01	9,39E-02	5,89E-05
Construction stage	1,82E-05	2,15E-01	3,02E-05
Use stage	0,00E+00	0,00E+00	0,00E+00
End of life stage	-8,67E-07	9,80E-01	-1,30E-06
<b>Total</b>	<b>2,52E-01</b>	<b>1,29E+00</b>	<b>8,78E-05</b>

### Parameters describing further output material flows

Parameter	Unit	Total
Components for re-use**	kg	0
Materials for recycling**	kg	0,11522
Materials for energy recovery**	kg	0,16066
Exported energy**	MJ per energy carrier	0

\*\* Only for foreground process from which LCI data are made available by TEPPFA - the number does not include processes and materials modeled by means of background data, e.g. transportation, electricity, ancillary materials.

## 4 SCENARIOS AND TECHNICAL INFORMATION

### 4.1 Construction process stage

#### Transport from the production gate to the construction site (apartment)

Parameter	Parameter unit expressed per functional unit
Fuel type consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat etc.	The PVC low noise soil and waste pipe system is transported over an average distance of 517 km with a truck and 30 km by means of a van from the producers of the different pipe system components via customers to the building. Environmental burdens associated with this kind of transport are calculated by means of the
Capacity utilisation (including empty returns)	
Bulk density	

Volume capacity utilisation factor (factor: =1 or <1 or ≥1 for compressed or nested packaged products)	Ecoinvent V3.4 datarecords "Transport, freight, lorry 3.5-7.5 metric ton, EURO4 {RER}  transport, freight, lorry 3.5-7.5 metric ton, EURO4   Cut-off, U" and "Transport, freight, light commercial vehicle {Europe without Switzerland}  processing   Cut-off, U".
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### Construction (installation in building/apartment)

Parameter	Parameter unit expressed per functional unit
Ancillary materials for installation	<p><b>0,0025 kg of soap (lubricant)</b>  <b>0,0094 kg of brackets</b> (2 for the installation) , considered to be made out of galvanised steel  <b>0,04 kg fast fixing cement</b> (ratio water/cement 0,3) of which 0,028 kg cement and 0,012 kg water  <b>0,002 kg of plastic fixing materials</b>, made out of polypropylene (PP)  <b>0,0011 kg of solvent cement</b>  <b>0,001 kg of cleaning agent</b></p> <p>Environmental burdens associated with this kind of input flows are calculated by means of the Ecoinvent V3.4 datarecords "Tap water {RER}  market group for   Cut-off, U", "Cement, unspecified {Europe without Switzerland}  production   Cut-off, U", "Soap {RER}  production   Cut-off, U", "Polypropylene, granulate {RER}  production   Cut-off, U in combination with Injection moulding {RER}  processing   Cut-off, U" and "Steel, unalloyed {RER}  steel production, converter, unalloyed   Cut-off, U", in combination with Metal working, average for steel product manufacturing {RER}  processing   Cut-off, U"</p>
Other resource consumption	Not relevant
Quantitative description of energy type (regional mix) and consumption during the installation process	<p><b>0,0008 kWh of electrical energy</b> is needed for the installation (screw driver)</p> <p>Environmental burdens associated with this kind of energy are calculated by means of the Ecoinvent V3.4 datarecord "Electricity, low voltage {RER}  market group for   Cut-off, U"</p>
Waste on the building site, generated by the product's installation	<p><b>0,01452 kg of PVC low noise pipe left left over</b> during installation: 80% to landfill, 15% to incineration and 5% to mechanical recycling. Transportation of PVC low noise pipe left over to waste management treatment facilities is included: 600 km to recycling plant, 150 km to incineration with energy recovery and 50 km to landfill. Environmental burdens are calculated by</p>
Output materials as result of waste management processes at the building site e.g. of collection for recycling, for energy recovery, final	

disposal	<p>means of the Ecoinvent v3.4 datarecord "Transport, freight, lorry 3.5-7.5 metric ton, EURO4 {RER}  transport, freight, lorry 3.5-7.5 metric ton, EURO4   Cut-off, U".</p> <p><b>0,112 kg of packaging waste:</b> treated according to European average packaging waste scenarios (EU27, 2006):</p> <table border="1" data-bbox="805 436 1284 604"> <thead> <tr> <th></th> <th>Recycling</th> <th>Energy Recovery</th> <th>Landfill</th> </tr> </thead> <tbody> <tr> <td>Plastic</td> <td>27%</td> <td>26%</td> <td>47%</td> </tr> <tr> <td>Paper and board</td> <td>75%</td> <td>10%</td> <td>15%</td> </tr> <tr> <td>Wood</td> <td>38%</td> <td>23%</td> <td>39%</td> </tr> <tr> <td>Metals</td> <td>66%</td> <td></td> <td>34%</td> </tr> <tr> <td><b>Total</b></td> <td><b>57%</b></td> <td><b>12%</b></td> <td><b>31%</b></td> </tr> </tbody> </table>		Recycling	Energy Recovery	Landfill	Plastic	27%	26%	47%	Paper and board	75%	10%	15%	Wood	38%	23%	39%	Metals	66%		34%	<b>Total</b>	<b>57%</b>	<b>12%</b>	<b>31%</b>
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Emissions to ambient air, soil and water	<p>No direct emissions at the building. Emissions are related to the upstream processes (, transportation processes and mechanical energy) and downstream processes (waste management and treatment) and are included in the Ecoinvent datarecords that are used for modelling the environmental impacts.</p>																								

## 4.2 Use stage: operation and maintenance

### Operation and maintenance:

Operational use is not relevant for the EPD, since it falls outside the system boundaries of the LCA project. Maintenance is not needed for the PVC low noise soil and waste pipe system. Moreover the PVC Low noise soil and waste pipe system is a gravity pipe system.

## 4.3 End of life

The following end of life scenarios have been taken into account:

- Estimated reference service life time of 50 years, being the service life time of the apartment
- EoL approach for landfill, incineration with energy recovery (impacts and credits are assigned to the life cycle that generates the waste flows)
- Recycled content approach for recycling and use of recyclates (= impact of recycling and credits for recyclates, because less virgin materials are needed is assigned to the life cycle that uses the recyclates)

Processes	Parameter unit expressed per functional unit
Collection process	<p>After a reference service life time of 50 years the PVC low noise soil and waste pipe system is stripped for recoverable materials and products, and the remaining construction subsequently demolished. The PVC low noise soil and waste pipe system is demolished together with the total construction. For the functional unit 0,937 kg of pipe system components are available at the apartment: 5% (0,0468 kg) is transported over an average distance of 600 km to a recycling plant, 15%</p>

(0,141 kg) is transported over an average distance of 150 km to an incinerator, and the remaining 80% (0,75 kg) is transported over an average distance of 50 km to a landfill.

EOL scenario PVC-U pipes	
Mechanical recycling	5%
Incineration	15%
Left in ground	80%

Environmental burdens associated with transportation are calculated by means of the following Ecoinvent v2.2 data record "Transport, lorry 3.5-7.5t, EURO4/tkm/RER"

## 5 ADDITIONAL INFORMATION ON EMISSIONS TO INDOOR AIR, SOIL AND WATER DURING USE STAGE

### Emissions to indoor air:

Despite there is no approved European measurement method available, we can confirm that the PVC Low noise soil and Waste pipe system does not contain any substances mentioned on the REACH-list.

### Emissions to soil and water:

Since the PVC Low noise soil and Waste pipe system is installed in the apartment we can confirm that emissions to soil and water are not relevant.

## 6 OTHER ADDITIONAL INFORMATION

### Product certification, conformity, marking

**EN 12056-1**, Gravity drainage systems inside buildings. Part 1: General and performance requirements

**EN 12056-2**, Gravity drainage systems inside buildings. Part 2: Sanitary pipe work, layout and calculation

### Other technical product performances

For the full overview of the environmental benefits of plastic pipe systems we will refer to the TEPPFA website: <http://www.teppfa.eu>

**List of names and logos of TEPPFA member companies**



**Aliaxis**



**Geberit International**



**Georg Fischer Piping Systems**



**Pipelife International**



**Polypipe**



**Rehau**



**Radius Systems**



**Tessenderlo Group**



**Uponor**



**Wavin**

## List of National Associations of TEPPFA

<b>ADPP</b>	- Czech Republic plastic pipes association
<b>ASETUB</b>	- Asociación Española de Fabricantes de Tubos y Accesorios Plásticos
<b>BPF</b>	- Plastic Pipes Group
<b>BureauLeiding</b>	- Dutch Plastic Pipes Association
<b>DPF</b>	- Danish Plastics Federation
<b>FCIO</b>	- Fachverband der Chemischen Industrie Österreich
<b>Federplast.be</b>	- Belgische Vereniging van Producenten van Kunststof- en Rubberartikelen bij Agoria en Essenscia
<b>FIPIF</b>	- Finnish Plastics Industries Federation
<b>KRV</b>	- Kunststoffrohrverband e.V.- Fachverband der Kunststoffrohr-Industrie
<b>MCsSz</b>	- Műanyag Csőgyártók Szövetsége
<b>IKEM</b>	- Swedish Plastics and Chemical Federation
<b>PRIK</b>	- Polish Association of Pipes and Fittings
<b>STR</b>	- Syndicat des Tubes et Raccords
<b>VKR</b>	- Verband Kunststoffrohre und Rohrleitungstelle
<b>Unionplast</b>	- Federazione Gomma Plastica – Pipes Sector Group

## List of names and logos of TEPPFA Associated Members



**Borealis**



**LyondellBasell**



**Vynova**



**Lubrizol**

## List of names and logos of TEPPFA Supporting Members



**Rollepaal**



**Molecor**

## REFERENCES

Ecoinvent, 2016. Ecoinvent database v3.3, Swiss Centre for Life Cycle Inventories, Switzerland. From: [www.ecoinvent.org](http://www.ecoinvent.org)

EN 12056-1, Gravity drainage systems inside buildings. Part 1: General and performance requirements

EN 12056-2, Gravity drainage systems inside buildings. Part 2: Sanitary pipe work, layout and calculation

EN 1329, Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticized poly vinyl chloride (PVC) low noise - Part 1: Specifications for pipes, fittings and the system

Eurostat, 2006. Packaging waste scenarios (EU27, 2006). From: [http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastestreams/packaging\\_waste](http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastestreams/packaging_waste)

EN 15804:2012+A1:2013: Sustainability of construction works – Environmental product declarations – core rules for the product category of construction products (2012);

EN 15942: Sustainability of construction works – Environmental product declarations – Communication format – Business to Business

ISO 14025: Environmental Labels and Declarations Type III

ISO 14040: Environmental management – Life cycle assessment – Principles and framework

ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines

### **Background LCA report (ISO 14040 and ISO 14044) prepared by**

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